Propensity score methods II: Weighting

Propensity score (PS) weighting methods include inverse probability treatment weighting (IPTW). , matching weighting, overlap weighting. These methods all used propensity score to weight the observations, resulting in a “pseudo” balancing sample.

Inverse probability weighting is a common approach, however, often come with a problem with extreme weights. In the case of extreme weights, some cases may be weighted much larger than the other cases, thus skew the effect. To deal with extreme weight, one may suggest truncating the weight. But this will exclude some observations, and the cutoff of the “extreme” weight is often artificial. In addition, when the propensity scores of the treatment and control groups have little area of overlapping, IPTW violates the assumption of common support. Best practice for IPTW can be reviewed in this article (Ref: PC. Austin Stat Med 2015). The alternative to IPTW is to use overlapping weight. Here is the key reference for overlapping weight: <https://www2.stat.duke.edu/~fl35/OW.html>

Here is the key point about the relationship between overlapping weight vs. regular IPTW weight. In below, h(x) will be the numerator, and the regular weight (denominator) would be the inverse probability weight. Applying a different numerator h(x) will yield different weights (weight (w1,w0)).

Table

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Here the $ \{w}\_{i} $ (weight) can be replaced by different weights in Table 1.

To obtain the “double robust” estimator (i.e. the augmented estimator), we could follow this equation:

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Ref: Liang Li\* and Tom Greene. A Weighting Analogue to Pair Matching in Propensity Score Analysis. The international Journal of Biostatistics 2013

Here are the R codes to apply the weights and calculate the IPTW ATE or the overlapping weight ATE.